

## REVIEW PAPER

# Complications and Patient-Reported Outcomes in Male-to-Female Vaginoplasty—Where We Are Today

## A Systematic Review and Meta-Analysis

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**Introduction:** There is an increased need for evidence-based practices in male-to-female (MtF) transgender vaginoplasty. Although there are a multitude of surgical techniques, there is a paucity of data comparing these procedures. A systematic review of retrospective studies on the outcomes of MtF vaginoplasty was conducted to minimize surgical complications and improve patient outcomes for transgender patients.

**Methods:** Applying the Preferred Reporting Items for Systematic Review and Meta-Analysis, a comprehensive search of several databases from 1985 to November 7, 2017, was conducted. The databases included PubMed, Ovid MEDLINE Epub Ahead of Print, Ovid Medline In-Process & Other Non-Indexed Citations, Ovid MEDLINE, Ovid EMBASE, Ovid Cochrane Central Register of Controlled Trials, and Web of Science. The resulting publications were screened, and those that met our specified inclusion/exclusion criteria were analyzed. The DerSimonian and Laird random-effects model was used to pool complications and patient-reported outcomes.

**Results:** A total of 471 articles were initially identified, of which 46 met our eligibility criteria. A total of 3716 cases were analyzed. Overall incidence of complications included the following: 2% (1%–6%) fistula, 14% (10%–18%) stenosis and strictures, and 1% (0%–6%) tissue necrosis, and 4% (2%–10%) prolapse (upper and lower limits of the 95% confidence interval). Patient-reported outcomes included a satisfaction rate of 93% (79%–100%) with overall results, 87% (75%–96%) with functional outcomes, and 90% (79%–98%) with esthetic outcomes. Ability to have orgasm was reported in 70% (54%–84%) of patients. The regret rate was 1% (0%–3%). The length of the vaginal cavity was 12.5 cm (6.3–4.4 cm).

**Conclusions:** Multiple surgical techniques have demonstrated safe and reliable means of MtF vaginoplasty with low overall complication rates and with a significant improvement in the patient's quality of life. Studies using different techniques in a similar population and standardized patient-reported outcomes are required to further analyze outcomes among the different procedures and to establish best-practice guidelines.

**Key Words:** gender confirmation surgery, vaginoplasty, male-to-female, patient-reported outcomes, transgender health

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Transgender patients are those whose gender identity differs from that associated with the sex they were assigned at birth, and represent in the United States alone approximately 1.4 million individuals, or 0.6% of the population.<sup>1</sup> The transgender population has been largely misunderstood, faced considerable discrimination in health care, and suffered from high rates of mental illness, violence, and sexual transmitted diseases.<sup>2</sup>

The distress caused by the discrepancy between a person's gender identity and the sex assigned at birth is known as gender dysphoria, a clinical diagnosis under the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*. Once this diagnosis has been made, patients can initiate a comprehensive treatment program that includes hormone therapy, psychological treatment, breast surgery, facial surgery, and genital confirmation surgery. Of all these treatment modalities, genital surgery is typically the final stage of the gender-confirming process and is associated with significant improvement in both the mental and sexual health quality of life (QOL).<sup>3,4</sup>

For transgender women, genital surgery entails vaginoplasty (bottom surgery), the surgical reconstruction of all the anatomical structures of the female external genitalia including the creation of a vaginal canal. The goal of this surgery is to create a functional feminine vulva, a deep and wide enough vaginal cavity to facilitate sexual penetration, a hooded sensitive clitoris, and labia minora and majora with the fewest possible surgical complications while at the same time offering the best possible esthetic and functional outcomes.<sup>5</sup> There are currently a number of different safe and reliable surgical approaches for vaginoplasty.<sup>6</sup> The most common technique used worldwide is the penile inversion; however, other procedures such as intestinal conduits or local flaps have been reported and may be better suited for the specific needs of certain patients. For example, patients on prolonged and early course of hormonal treatment may present with hypoplasia complicating the standard penile inversion technique, in which case pedicle bowel flaps are a valuable alternative.<sup>7</sup>

Regardless of the specific technique, there has been a remarkable increase in the number of transgender-related surgeries in the last 5 years, with an estimated increase of nearly 20% from 2015 to 2016.<sup>8</sup> This significant growth stems from both the growing visibility and acceptance of transgender patients in the United States and the rapid increase in insurance coverage for health care services related to gender transition. Today, there is medical consensus on the necessity of gender transition, new policies prohibiting insurance discrimination against transgender patients, and mounting evidence in support of the cost-effectiveness of insurance coverage for this population.<sup>9</sup>

Organizations such as the World Professional Association for Transgender Health have paved the way toward establishing ethics and standards of best practices for treating transgender individuals. However, data on the complications and patient-reported outcomes of male-to-female (MtF) vaginoplasty have been limited to a number of retrospective reviews representing the personal experiences of the few experts in this field.<sup>10</sup> Therefore, both academic centers and private plastic surgeons facing increasing demands for MtF vaginoplasty lack the literature to better develop and compare their techniques, and educate both their trainees and patients. Toward addressing this paucity in

data, this study conducts a comprehensive systematic analysis of 46 seminal papers in MtF vaginoplasty with meta-analysis of both complications and patient-reported outcomes. The ultimate goal of this review is to build the foundation for developing standardized protocols in the surgical management of transgender women.

## METHODS

### Search Methodology

Applying the Preferred Reporting Items for Systematic Review and Meta-Analysis, a comprehensive search of several databases from 1985 to November 7, 2017, was conducted.<sup>11</sup> The databases included PubMed, Ovid MEDLINE Epub Ahead of Print, Ovid Medline In-Process & Other Non-Indexed Citations, Ovid MEDLINE, Ovid EMBASE, Ovid Cochrane Central Register of Controlled Trials, and Web of Science. The search strategy was designed and conducted by experienced librarians with input from the study's principle investigator.

Search terms were formulated using the PICO structure. Participants (P) included transgender women. The intervention (I) was vaginoplasty. Comparisons (C) addressed the specific vaginoplasty technique used. Outcomes (O) included complications and functional and esthetic patient-reported outcomes.

All search results were combined in EndNote, a bibliographic management tool. This search strategy had 3 concepts; the concepts

were linked together with the AND operator: (1) sex reassignment surgery, (2) MtF sex change, and (3) patient-reported outcomes. For all databases, controlled vocabulary and text word searches were performed, using a combination of the keywords "vaginoplasty," "gender confirmation surgery," "genital reconstruction," "transgender surgery," "sex reassignment surgery," and "male to female." Manual searches of references from retrieved articles, major journals in the field, and gray literature (eg, abstracts from scientific proceedings) were also performed to identify any additional relevant articles missed by online indexes. A complete list of search terms has been included in the supplementary material (Appendix A <http://links.lww.com/SAP/A265>).

### Inclusion and Exclusion Criteria

Search results were reviewed independently by 2 of the authors, a board-certified plastic surgeon with more than 5 years of experience performing MtF vaginoplasty and a medical research fellow with substantial experience in meta-analysis. Our inclusion criteria included a sample size of more than 5, only MtF vaginoplasty, all ages, after 1985, all techniques for complete vaginoplasty, articles reporting at least one outcome measure, and a follow-up of at least 1 year.

Our exclusion criteria included patient groups consisting of patients other than MtF transgender, surgical techniques for partial reconstruction of the vagina or correction after vaginoplasty, surgical techniques only for creation of neoclitoris or labioplasty, unspecified

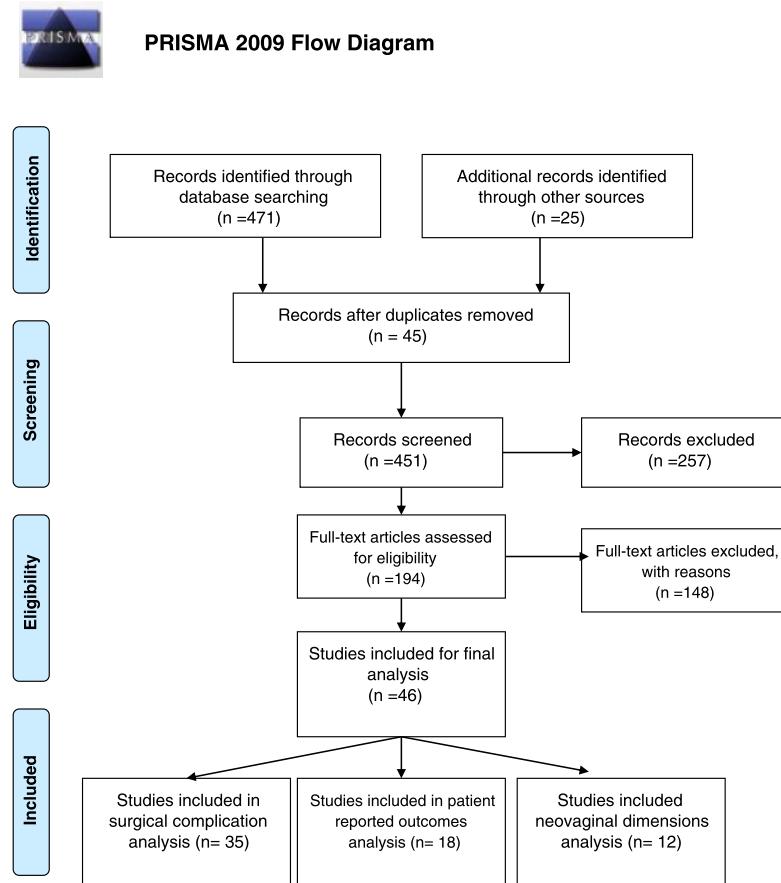
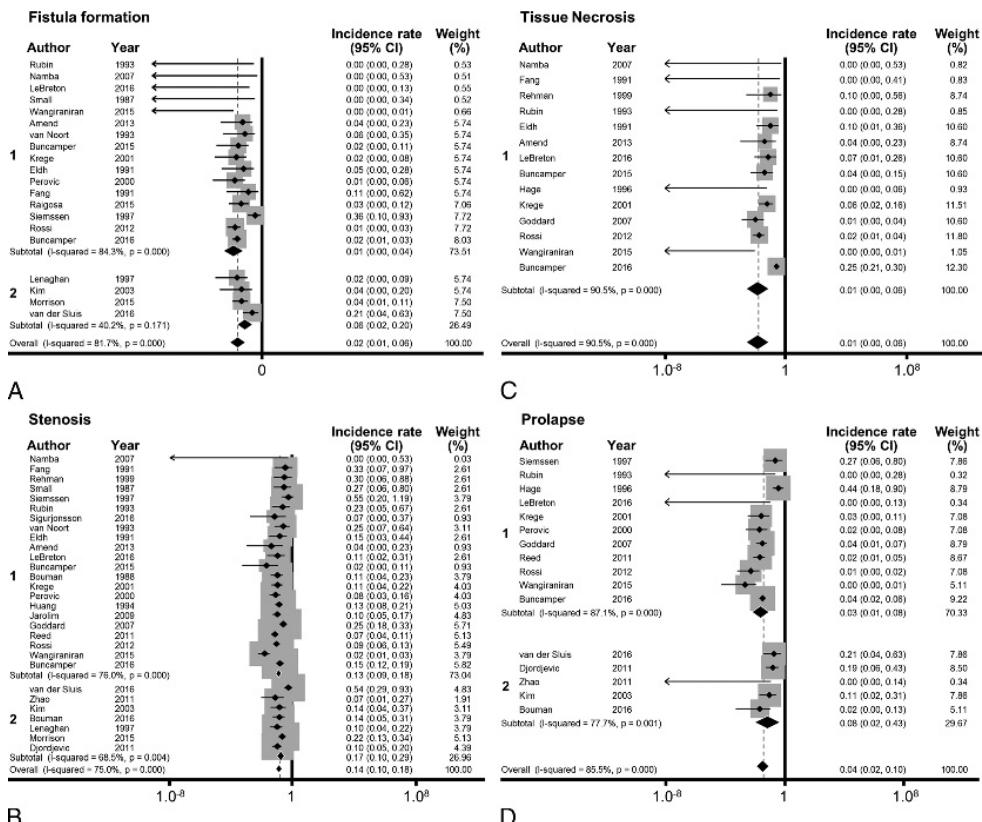


FIGURE 1. Systematic review flow diagram.



**FIGURE 2.** Surgical complications after vaginoplasty with either penile inversion technique (1) or bowel pedicle flap (2).

surgical technique, non-English publications, cancer-related publications, trauma-related publications, and congenital-related publications.

## Data Extraction

For all included articles, we assessed study characteristics (ie, type of approach, year of publication, and country of origin). Complications were assessed and major complications categorized as fistulas, vaginal and urethral stenosis and strictures, tissue necrosis, and prolapse. Complications were reported as events and not number of patients. Fistulas were labeled as rectovaginal and vaginal. For stenosis and strictures, these included those recorded as introital, stoma, urethral, and vaginal. Strictures were both partial and complete. Necrosis of the urethra, glans, clitoris, and labia were all included in tissue necrosis. Prolapse was a rectocele, a urethral, or a mucosal.

Patient-reported outcomes were analyzed as percentages of patients satisfied with overall results, function, and esthetic outcome. Satisfied included “very satisfied” and “mostly satisfied” in studies that made the distinction. For esthetic outcome, if the patients were satisfied that their vaginal appearance was feminine enough, this was interrupted as the patients being satisfied with esthetic results.

The ability to have orgasm, the percentage of patients with regret, and the response rate for patient-reported outcomes were also included. The vaginal cavity length and range reported were pooled, but length was not included because this was not consistently found in most studies.

Studies including standardized questionnaires were pooled separately, but not included in the meta-analysis of patient-reported outcomes discussed earlier. Included questionnaires were the Female

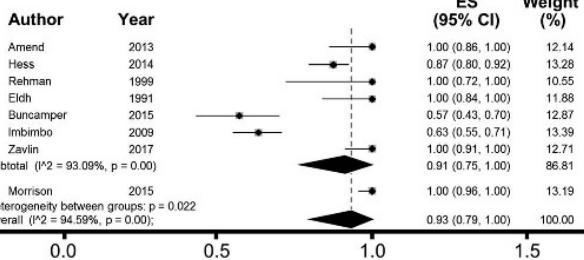
## Quality Assessment

To assess the risk of bias within the included studies, the Newcastle-Ottawa Scale for assessing the quality of nonrandomized studies in meta-analyses was used.<sup>12</sup> Using this scale, a nonrandomized study can be awarded a maximum of 9 stars on items related to the selection of the study groups (4 points), the comparability of the exposed and unexposed groups (2 points), and the ascertainment of outcomes of interest (3 points).

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) assessment was conducted to evaluate the overall strength of evidence of this systematic review and to determine the confidence with which conclusions and recommendations could be made.<sup>13</sup> The overall quality of the body of evidence was rated as being very low, low, moderate, or high.

## Statistical Analysis

For complications, we calculated incidence rate and related 95% exact Poisson confidence intervals (CIs). The DerSimonian and Laird random-effects model was used to pool natural log-transformed incidence rate and related 95% CI. For patient satisfaction, we calculated percentage of satisfaction and related 95% Wilson CIs. We used the same DerSimonian and Laird random-effect model to pool the Freeman-Tukey double-arc sine-transformed percentage of satisfaction and 95% CI. All statistical analyses were conducted using Stata version 15.1 (StataCorp LLC, College Station, TX).

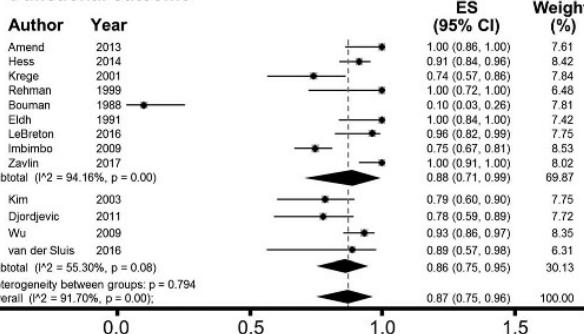
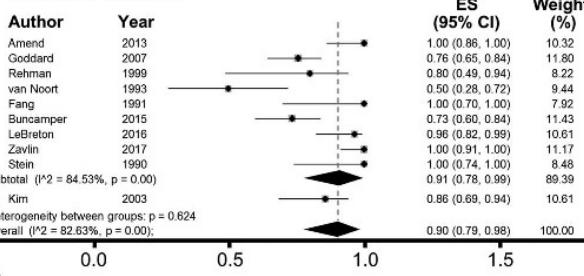
**Overall****RESULTS****Study Retrieval, Procedures, and Characteristics**

Four hundred seventy-one citations were identified through the PubMed, MEDLINE, and EMBASE databases. A flowchart diagram of our study selection is outlined in Figure 1. Of the 471 relevant abstracts that underwent abstract review, 194 studies underwent full-text review and 46 were eligible for final review. Notably, all of the included studies were assigned either low or very low-quality ratings in accordance with the Newcastle-Ottawa Scale (<4 of a possible 9). Appendix B <http://links.lww.com/SAP/A266> includes a complete list of publications reviewed and their quality score.

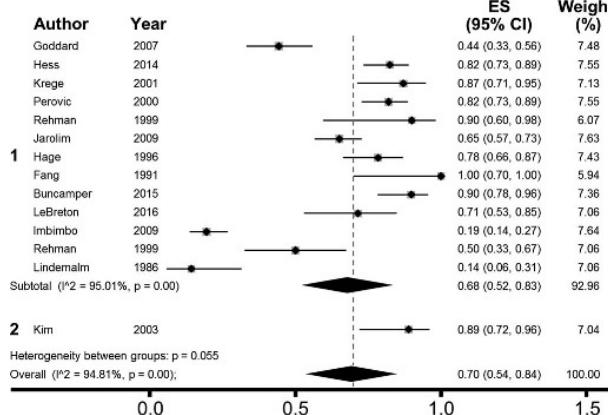
In total, these studies represented 3716 cases. Thirty-five studies reported surgical complications,<sup>14–46</sup> whereas 18 studies included patient-reported outcomes<sup>5,14,15,18–20,24,32–41,43,46–52</sup> and 12 studies reported vaginal length.<sup>5,14,15,18,19,21,22,25,28,30,31,38,40–46,51–55</sup>

Thirty-seven (80.8%) studies used the penile inversion technique with or without scrotal flap,<sup>14–17,26–39,47–50,53,56,57</sup> Nine (26.5%) used a bowel pedicle flap,<sup>16–23,38</sup> of which 3 used the sigmoid colon as a conduit,<sup>18,19,22–24</sup> 3 used the ileum,<sup>20,21</sup> and 1 used the transverse colon.<sup>58</sup> There were 3408 (91.7%) reported cases using the penile inversion technique compared with 308 (8.3%) intestinal flaps. Our initial search yielded 2 studies that used a pudendal groin flap<sup>45,46</sup> and 1 study that used peritoneal tissue<sup>59</sup>; however, these were not included in our final pooled analysis.

The average study case size was 81, with the smallest study including 7<sup>39</sup> patients and the largest study including 475.<sup>50</sup>

**Functional outcome****Aesthetic outcome****C**

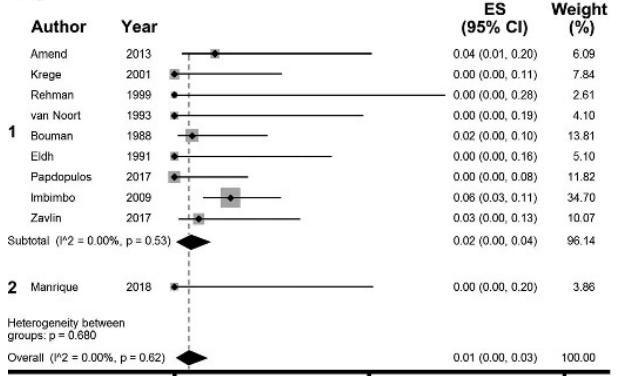
**FIGURE 3.** Patient-reported outcomes after vaginoplasty with either penile inversion technique (1) or bowel pedicle flap (2).

**Ability to Orgasm**

**FIGURE 4.** Ability to orgasm after vaginoplasty with either penile inversion technique (1) or bowel pedicle flap (2).

**Complications**

Complications from pooled data including both skin inversion technique and vaginoplasty with intestinal flaps showed 1% (1%–6%) fistula, 14% (10%–18%) stenosis and strictures, 2% (0%–8%) tissue necrosis, and 4% (2%–10%) prolapse, of which the majority were neovaginal (78%) and the remaining urethral. Figure 2 shows overall complications and grouped by vaginoplasty technique. Complications with the penile inversion technique included 1% (0%–5%) fistula formation, 10% (7%–15%) stenosis or stricture, 2% (0%–8%) tissue necrosis, and 3% (1%–8%) prolapse (77% neovagina, 23% urethral). Complications with intestinal vaginoplasty included 6% (2%–20%) fistula formation, 17% (9%–16%) stenosis or stricture, and 3% (1%–8%) prolapse (81% neovagina, 29% urethral). There were no reported cases of partial or complete tissue necrosis in the intestinal pedicle group. Most complications reported among the 2 techniques had an  $I^2$  value greater than 50%.

**Regret**

**FIGURE 5.** Patient regret after vaginoplasty with either penile inversion technique (1) or bowel pedicle flap (2).

representing considerable heterogeneity in the number complications reported (GRADE: low quality).

### Patient-Reported Outcomes

Patient-reported outcomes pooled from studies with both techniques, as shown in Figure 3, included an overall satisfaction rate of 92% (75%–100%) with overall results, 86% (72%–95%) with function, and 90% (74%–95%) with esthetic outcomes. With the penile inversion technique, patient-reported outcomes included a satisfaction rate of 88% (71%–99%) with overall results, 86% (66%–98%) with function, and 86% (71%–96%) with esthetics outcome. Only one study reported overall satisfaction with overall results, and all patients in this study were satisfied.<sup>22</sup> Satisfaction with functional outcomes in the intestinal vaginoplasty group was of 86% (75%–95%). One group reported satisfaction with esthetic outcomes in this group, which was 86% (69%–94%).<sup>16</sup>

The ability to have an orgasm was 76% (60%–90%; Fig. 4). Within the penile inversion group, this was 75% (57%–89%). One study reported this for intestinal vaginoplasty, which was 89% (72%–96%).

Regret (Fig. 5) about have the procedure was 1% (0–3%) overall, 2% (0–4%) in the penile inversion group, and 0% in the one study that reported this in the intestinal vaginoplasty group.<sup>38</sup> The GRADE results for all patient-reported outcomes were very low and low quality.

### Standardized Questionnaires

Validated standardized questionnaires were included in only 5 studies, as shown in Table 1. Djordjevic et al<sup>19</sup> and Manrique et al<sup>58</sup> using the intestinal vaginoplasty and Buncamper et al<sup>33</sup> using the penile inversion technique surveyed patients with the FSFI. The average FSFI was 28.7 among the 2 publications reporting on intestinal vaginoplasty compared with 18.7 with penile inversion technique. A reference FSFI of  $31.2 \pm 3.9$  was reported in nontransgender women.<sup>19</sup>

Djordjevic et al<sup>19</sup> and Lebreton et al<sup>34</sup> report outcomes with the Beck Depression Inventory (BDI). The average BDI with intestinal vaginoplasty as reported in Djordjevic et al was 7.55 compared with 8.4 with patients undergoing penile inversion as reported in Lebreton et al. A score of 0 to 9 on the BDI indicated minimal depression, whereas any score higher indicated mild, moderate, or severe depression.

Papadopoulos et al<sup>56</sup> and Lindqvist et al<sup>60</sup> were studies that reported on overall QOL using the Questions of Life Satisfaction and Short Form-36 surveys, respectively (Table 2). Both studies showed that the overall QOL was lower for transgender patients; however, there was a considerable improvement after surgery. For example, the sum score Questions of Life Satisfaction survey was  $43.02 \pm 35.81$  in the transgender population compared with a reference of  $62.60 \pm 37.20$  in the nontransgender, but 42 patients stated that QOL was improved or very improved by surgery (91% scores  $>7$ ; Likert scale: 0, no improvement, and 10, strong improvement).

### Vaginal Cavity Dimensions

Twelve studies, as shown in Figure 6, reported on the length of the neovaginal cavity. The average length was 12.2 cm (10.2–14.2 cm). With the penile inversion technique, the average cavity length was 10.7 cm (8.8–12.4 cm). With the intestinal vaginoplasty, the average cavity length was 15.3 cm (14.3–16.3 cm). Overall, there was considerable heterogeneity both among the publications and the patients within each study (Table 2).

### DISCUSSION

Transgender women undergoing MtF vaginoplasty require reconstruction of the female external genitalia complex with adequate aesthetics and functionality. This can be accomplished by a number of different techniques including penile inversion vaginoplasty, scrotal flaps, scrotal skin grafts, non-scrotal flaps/skin grafts, bowel conduits, and peritoneal vaginoplasties. The most common technique used worldwide is the penile inversion technique. The quantitative comparison of complications and patient-reported outcomes in the 34 retrospective studies conducted in this systematic review provides surgeons, trainees, and patients with improved understanding of outcomes with these procedures.

The penile inversion vaginoplasty has gained popularity among surgeons, because it allows the formation of the external female genitalia and vaginal cavity using local flaps. This technique involves dissection of the penile skin from the shaft of the penis, formation of a neovaginal cavity between the rectum and the urethra, and inversion of the penile skin into the cavity to form the introitus vaginalis with a full-thickness scrotum skin graft as the lining of the neovagina.

Overall, there were more than 3-folds the number of articles with the penile inversion technique compared with other techniques. This emphasizes the techniques popularity with low complication rates and high patient satisfaction. The aggregation of all the complications including both major (ie, rectovaginal fistula) and minor (ie, partial urethral stricture) in our meta-analysis was less than 15%. However, many of these studies were limited by the number of patients, minimal follow-up period, and patients lost to follow-up. Furthermore, lack of standardized protocols for assessment of complications and patient-reported outcomes created challenges in yielding comparisons between these studies. This was reflected in the high heterogeneity among the studies.

The largest retrospective study to date using the penile inversion vaginoplasty was completed by Buncamper et al<sup>33</sup> with a total of 475 patients undergoing surgery and an average follow-up period of 7.8 years (1–15.9 years). Postoperative complications occurred frequently based on their study, but were generally minor and easily treated. The only reported long-term complications were 3 rectovaginal fistulas (0.6%) that were successfully treated. Revision vaginoplasty was necessary in 14 patients (2.9%). Although the strength of this study was in its high case volume, one of the limitations was that complications may have presented at other institutions and, therefore, influenced long-term follow-up data. In addition, the study only reported surgical outcomes, and the lack of patient-reported outcomes was a significant

**TABLE 1.** Standardized Questionnaire Results for Sexual Function, Self-image, Depression, and Pelvic Floor Function

Study	Type of Procedure	N	FSFI	BDI, Mean	FGSIS	AHPFS-W
Djordjevic et al <sup>19</sup>	Bowel pedicle	27	28.9	7.55		
Buncamper et al <sup>36</sup>	Penile inversion	49	$18.7 \pm 10.8$ ( $31.2 \pm 3.9$ )		$22.6 \pm 4.1$ ( $21.0 \pm 0.8$ )	$9.00 \pm 2.16$ ( $8.74 \pm 2.24$ )
Lebreton et al <sup>34</sup>	Penile inversion	28		8.4		
Buncamper et al <sup>55</sup>	Penile inversion	100	$16.9 \pm 8.9$		$21.8 \pm 5.2$	

Reference values provided in parentheses when cited in publication.

AHPFS-W, Pelvic Floor Functioning Index; FGSIS, Female Genital Self-Image Scale.

**TABLE 2.** Patient QOL Postoperatively

Questions on Life Satisfaction Modules	Questions on Life Satisfaction Modules	SF-36	SF-36 Reference
General	General		
Papadopoulos et al <sup>54*</sup>			Lindquist et al <sup>60</sup>
Friends: 8.30 (SD, 8.47)	Friends: 8.70 (SD, 5.83)	Mental health: 66.1 (58.2–74.1; SD, 26.6)	Mental health: 79.6 (79.0–80.2; SD, 19.4)
Hobbies: 5.72 (SD, 6.30)	Hobbies: 6.68 (SD, 5.73)	Vitality: 57.3 (49.4–65.3; SD, 26.6)	Bodily pain: 66.7 (66.0–67.4; SD, 23.2)
Health: 6.74 (SD, 6.27)	Health: 9.27 (SD, 7.13)	Bodily pain: 72.5 (64.5–80.4; SD, 26.5)	Social functioning: 72.7 (71.9–73.4; SD, 26.5)
Income: 3.04 (SD, 6.88)	Income: 5.55 (SD, 6.97)	Social functioning: 69.8 (60.8–78.9; SD, 29.4)	Role emotional: 87.5 (86.9–88.1; SD, 20.8)
Work: 2.77 (SD, 7.14)	Work: 5.52 (SD, 7.15)	Role emotional: 59.7 (46.5–72.9; SD, 44.0)	Role physical: 84.0 (83.1–85.0; SD, 30.9)
Living conditions: 5.68 (SD, 5.91)	Living conditions: 9.21 (SD, 6.30)	Role physical: 70.9 (58.3–83.6; SD, 42.2)	Physical functioning: 86.2 (85.6–86.8; SD, 20.4)
Family life: 5.87 (SD, 8.18)	Family life: 10.32 (SD, 7.20)	Physical functioning: 91.5 (88.0–95.1; SD, 11.8)	General health: 75.1 (74.5–75.8; SD, 22.7)
Partner relationship: 4.45 (SD, 9.74)	Partner relationship: 7.39 (SD, 7.88)	General health: 48.1 (44.2–51.9; SD, 12.6)	
Sum score: 43.02 (SD, 35.81)	Sum score: 62.60 (SD, 37.20)		

\*Likert scale: 0/4 no improvement; 10/4, strong improvement.  
SF-36, Short Form-36 Health Survey.

limitation of the study. Because evaluation of outcomes in gender confirmation surgery relies heavily on assessment of patient's psychosocial well-being, patient-reported outcomes are critical for both patients and surgeons.

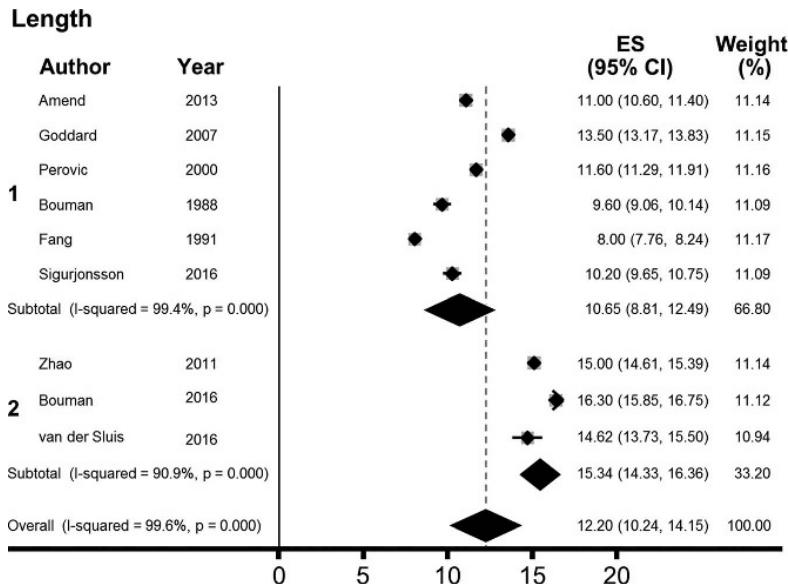
Although the penile inversion approach remains the most common technique, its drawbacks include prolonged use of a vaginal dilator, contraction of the neovaginal canal, malodor, and the necessity of lubrication for intercourse. The use of the intestine for reconstruction of the vagina has been proposed as alternative surgical option without these limitations. A large series with the long-term safety, efficacy, and complication profile of 83 patients who underwent primary rectosigmoid vaginoplasties was published by Morrison et al.<sup>24</sup> They reported a 45 (54.2 %) complication rate, all of which required revision surgery. The most common complications were stricture of the anastomotic site and protrusion of the corpus spongiosum, but the incidence of these decreased with increased surgeon experience. Although their study included patient-reported outcomes, their use of the Likert scale prevented us from performing quantitative comparison with other studies, which reported satisfaction as a percentage. This discrepancy in use of methods of evaluating patient-reported outcomes only further emphasizes the importance of developing standardized questionnaires for this patient population. In addition, limitations of their study included a small survey response rate, with only 21 of the 83 patients who underwent rectosigmoid vaginoplasty successfully contacted about their outcomes. Furthermore, although they collected subjective information from the patients, they lacked objective data from physical examinations postoperatively.

Both the penile inversion and intestinal vaginoplasty offer their distinct advantages, and further analysis of the complication rates and patient-reported outcomes will help in patient education and selection. An overarching observation in our literature review was the lack of validated tools for evaluating patient-reported measures. Only 5 studies in our analysis used any form of a validated questionnaire, most of which were intended for non-transgender women and not ideal for assessing female genital self-image or female sexual function in the MtF transgender population. Furthermore, although there were a higher percentage of fistulas, stenosis, strictures, and prolapse in the intestinal group, these were not statistically significant.

All studies included were single-arm and noncomparative limiting the validity of a direct comparison between the 2 techniques.<sup>61</sup> Although all studies reported on primary vaginoplasties for gender confirmation, important variation existed in the size and characteristic of the patient populations, the number of publications and their year, and indications for choosing one technique over another. These differences would have introduced biases and confounding factors if a direct comparison was made.<sup>59</sup> Penile inversion technique was significantly more common and had a larger average number of patients per study, and publication years spanned a longer period. Meanwhile, intestinal vaginoplasty was often indicated in patients whom puberty-suppressing hormonal treatment had resulted in penile and scrotal hypoplasia,<sup>7,22</sup> further changing the patient population. Future studies using both techniques in similar populations are required before definitive comparisons can be made between the different techniques. Based on the meta-analysis of current publications, the ultimate decision of which procedure a patient should undergo should be tailored to the patient's anatomy, the amount of time on hormonal therapy, surgeon's expertise, and, most importantly, patient needs.

## CONCLUSIONS

The future of transgender care is rapidly evolving with increasing social awareness and acceptance. However, the transgender population continues to face major challenges and marginalization in their daily life. For many of these patients, MtF vaginoplasty has shown to be a safe and reliable option that can have drastic reduction in dysphoria and improvements in QOL. The need for developing standardized techniques and



**FIGURE 6.** Average vaginal cavity length after vaginoplasty with either penile inversion technique (1) or bowel pedicle flap (2).

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methods of evaluating outcomes specific to this population is critical for continued surgical advancements in this field and improved patient education about the procedures and the expected results.

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